

# Hysteresis of Certain Alcohol-Induced Effects Upon Reaction Time with Particular Regard to New Object Recognition

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Simon Edwards

Research Acceleration Initiative

## **Introduction**

Although there have been hundreds of studies into the effects of alcohol upon reaction time, reaction time with regard to visual stimulus varies depending upon the nature of the stimulus. Object recognition is a complex process which is a necessary first step in the analysis of visual information which informs situational awareness and reaction to dynamically changing situations.

## **Abstract**

The task of driving is one which requires not merely the ability to react to dramatic, unnatural changes in the visual field such as those used in reaction time testing (e.g. the color of a computer screen changing, the appearance of a colored dot, etc.) Limiting reaction time testing to these sorts of unnatural visual inputs provides a misleadingly simplistic understanding of reaction time impairment vis a vis alcohol consumption.

The task of driving, for example, requires the comparison of observed objects in motion to established "normal" patterns of motion. This requires, primarily, the ability to recognize the presence of "new objects" such as a yellow or white painted line in an abruptly new position (this would be considered a 'new object' in neurological terms) and secondarily, the ability to compare the normal pattern with the established 'normal' pattern.

Conventional wisdom holds that the computational complexity of comparison of established patterns of a complex visual nature to the newly observed patterns is the more demanding of the two processing tasks, particularly for an impaired person. This is, I propose, not the case. Furthermore, this neurological function (of comparison of relative object position over multiple observations) is not the most severely impacted function with regard to alcohol-induced impairment. Base reaction time to visual changes generally, although it has been empirically demonstrated to be impaired by the presence of alcohol in neural tissue, is not the primary factor leading to an increased likelihood of automobile accidents and fatalities.

As the secondary process of comparison of "established normal" patterns and "newly observed" patterns (the recognition that an object is in motion) first requires object recognition to be performed in the first place, a severe impairment in the ability to recognize objects could be responsible for much of the performance deficit observed during complex tasks such as driving.

For instance, if an impaired driver fails to observe that a white line indicating the beginning of a highway shoulder is moving closer to the center of his or her visual field, one might attribute this to generic delayed reaction time or to an inability to recognize complex patterns. I posit, conversely, that this failure is the result of an impairment of the far more complex task of recognizing a new object (even when this object is familiar) and that the observation of the same object in a new general area of the visual field is interpreted by the brain as a "new object," rather than as a changed form of an existing object as is conventionally held.

Importantly, this impairment subtype; for which researchers have not empirically tested; may be more severe than generic reaction time delay in cases of alcohol-induced impairment. This sort of impairment is certainly far more consequential than factors such as balance impairment, particularly given that perfect balance is not required for the task of driving. While balance impairment is easy to test for in field sobriety tests, the widespread notoriety of this aspect of field sobriety tests has inadvertently confused much of the research surrounding this topic. Driving is primarily a visually-guided exercise.

It may well be possible that an impairment in the length of time it takes to recognize the presence of a "new object" in the visual field could be delayed by 2-3 fold the length of time of generic reaction time impairment. This differential ratio of reaction time delay according to reaction time subtype is perhaps greatest in the cases of the most severe impairment.

Importantly, this type of reaction time impairment may be greatest during the 'hangover' period when alcohol is no longer present in the bloodstream but during which certain undesired effects are known to linger. Beyond a feeling of general dysphoria, new object recognition may, if a study is conducted, be found to be most severe in the hours after alcohol levels in the bloodstream have returned to zero. This may account for why known heavy drinkers are more likely to be involved in automobile accidents even when they lack detectable levels of alcohol in their bloodstream. It may be possible that there is as much as a three-second delay in the length of time required for a "hung over driver" to recognize a new object despite the lack of alcohol in the bloodstream of the impaired person.

## **Conclusion**

If experimentally proven, this insight should be used to inform new guidelines for drivers and new restrictions upon driving for "hung over" drivers.